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Research & Development

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Chemical R&D

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Research & Development

SERVING THE $214-BILLION WORLDWIDE R&D INDUSTRY

ABOUT THE COVER

The cover photo was made through a port in the door of a Denton Vacuum DVB-44 box coater. The CC-101B ion source was operating in an oxygen atmosphere for ion-assisted deposition.

All light comes from the unit itself, with no outside light source. This is, perhaps, the first time that the actual electron path has been made visible. The ionized cloud also can be seen in the photo.

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CHANGE CHARACTERIZES R&D AS INDUSTRY ENTERS 1986

Survey shows that shifts have occurred in rates of salary increases, years of experience, and balance of academic achievement, completely rearranging our industry profile.

Robert R. Jones, Editor

THE R&D INDUSTRY is more noted for change than stability, but the past 12 months in research, development, and quality assurance have been months of unusual flux.

Shifts have occurred in national and international manufacturing and marketing patterns, in corporate structures, in company ownerships, in product lines, in starting salaries, in retirement programs, and in other important features of this industry with a resulting low-level but very real impact for research and development on who is doing what for whom and for what rewards.

Despite all of the changes, this year's annual profile of our industry brings good news for most workers. Salaries remain good, largely advancing faster than inflation, and indicators point to a substantial body of new workers joining the industry.

We present here the first of a two-part report based on our annual survey of workers' salaries and related rewards in research, development, and quality assurance. This article deals, for the most part, with the total survey population of more than 3,600 respondents.

As was mentioned in last year's report, our salary survey scale was established in the early years of this annual study with $3,000 spans—$16,000 through $18,000, $19,000 through $21,000, etc. In the years when our top income figure was below $50,000 this was easy to handle.

However, as we added a span or two each year and reached $70,000, the number of spans became burdensome and charts became needlessly complex.

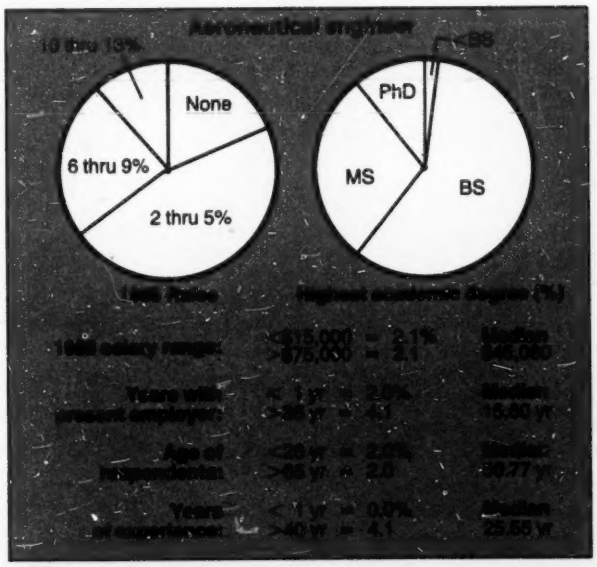
Last year we made a break, realizing that to do so would interrupt the easy comparison of year-to-year changes. Now the spans cover $5,000, *e.g.*, $15,000 through $19,000.

Part of the above problem lay in the fact that while the top end of the range for workers in research, development, and quality assurance moved steadily upward, the bottom end seemed permanently fixed somewhere below $15,000.

Then, it was first noted two years ago that the total salary range finally appeared to be moving upward. While this year still finds nearly one percent (0.9%) of the respondents in the "less than $15,000" salary range, this is down from 1.6% last year.

The number at the upper end ($75,000 per year or more) has increased since last year by about the same amount, from 1.5% of the repondents to 2.0%.

With two out of every 100 workers in R&D earning $75,000 a year or more, it is hard to believe that just six years ago the upper range in our survey was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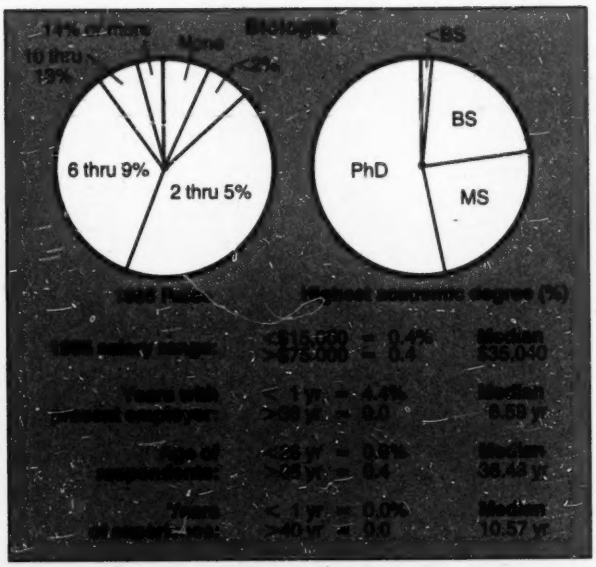
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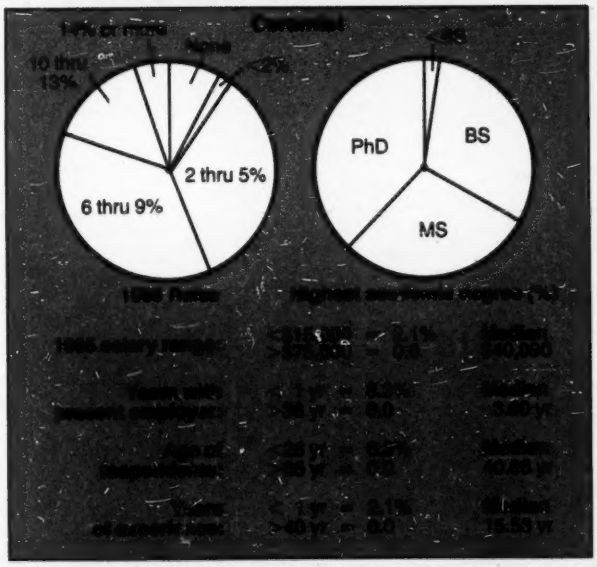
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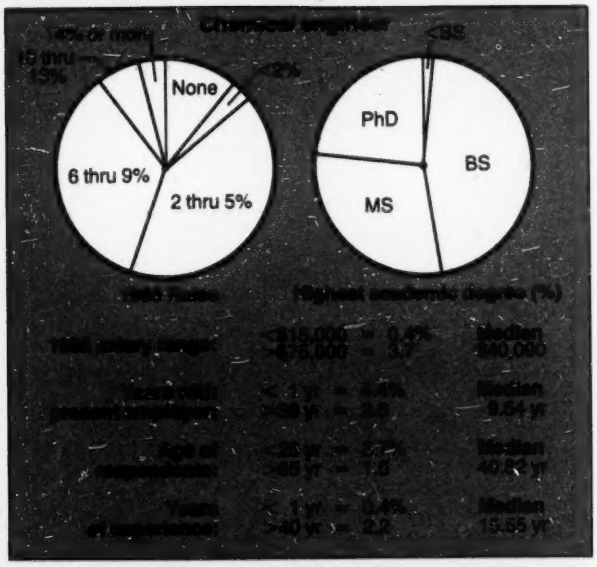
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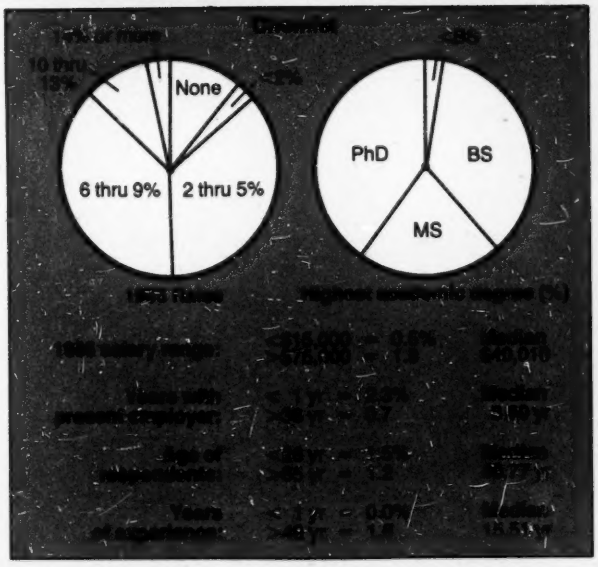
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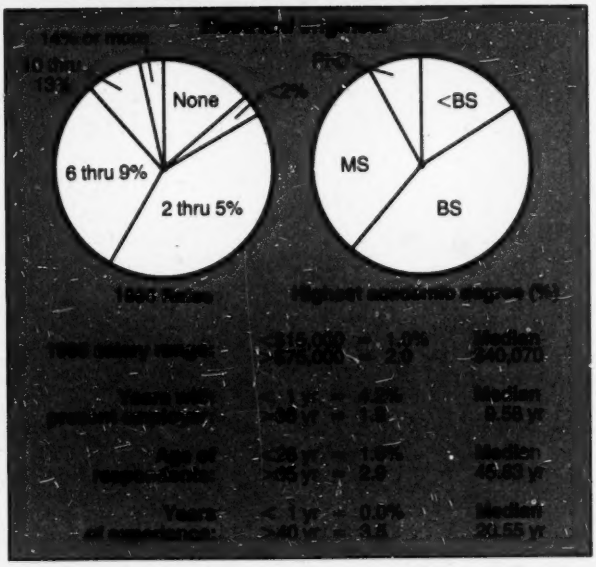
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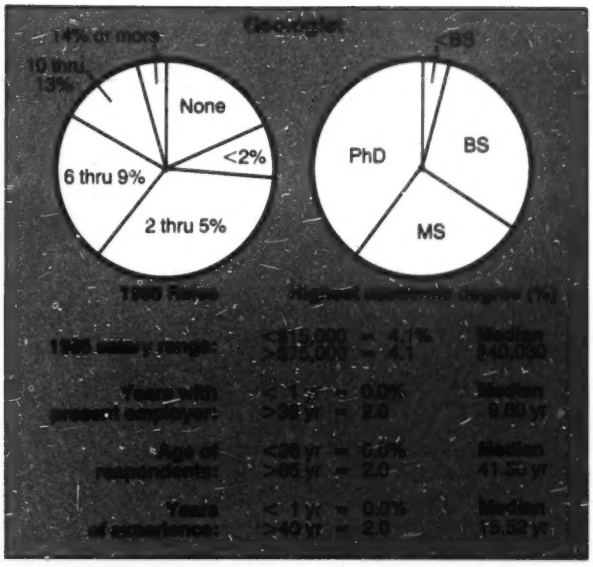
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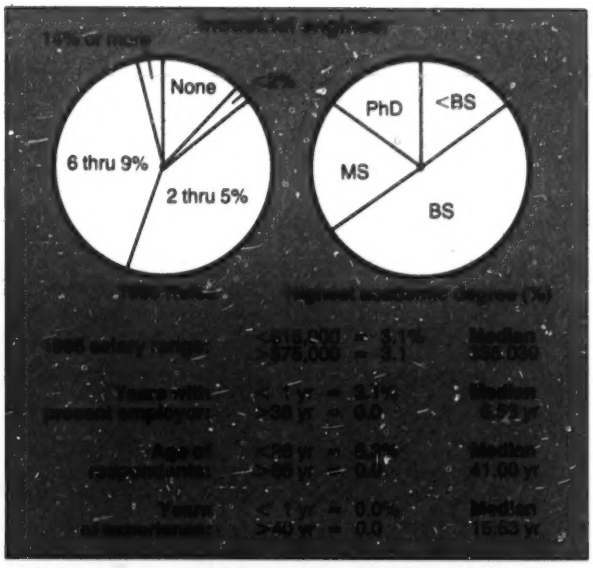
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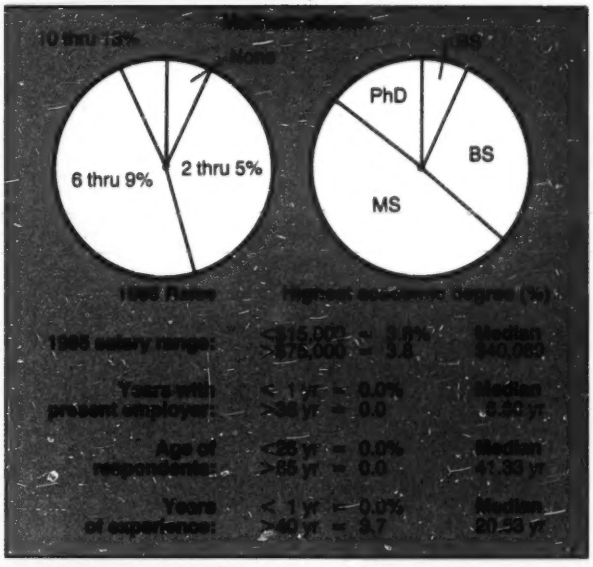
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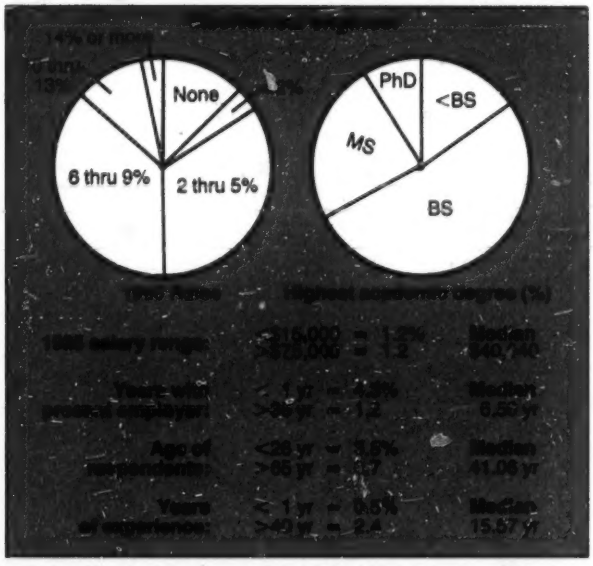
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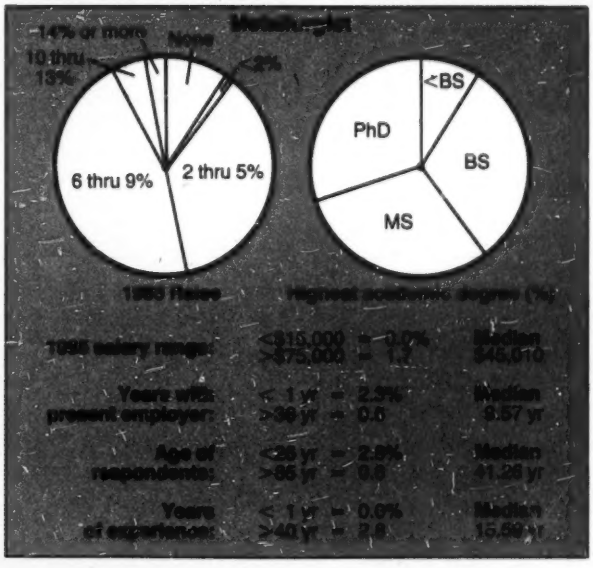
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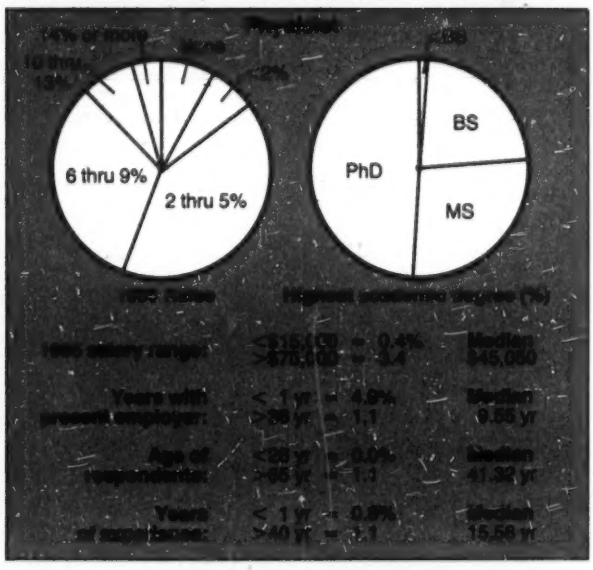
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$46,000. At that time the bulk of the respondents fell into the $25,000 through $27,000 category.

Salary increases this year are smaller than in some recent years, but we continue to enjoy low inflation rates, with one result being that the portion of respondents' raises which exceed the rate of inflation stays about the same.

Increases in rate of pay

	% of respondents				
Amount	1986	1985	1984	1983	1982
None	11.3	9.3	16.3	14.7	6.3
Less than 2%	3.6	2.9	2.1	1.9	1.2
2 through 5%	37.1	36.6	26.9	15.9	10.6
6 through 9%	36.3	37.6	38.9	34.2	34.5
10 through 13%	8.3	10.1	11.5	25.1	34.0
14% or more	3.3	3.6	4.4	8.2	13.3
Ahead of inflation	60.1	63.3	54.8	33.4	47.3

Once again buying power has increased for R&D workers as a group, with 3 out of 5 getting salary increases that do more than just stay even with inflation. This is true even though the percentages in the upper salary increase levels are much lower than they were in the early part of the 1980s.

The percentage receiving no salary increase for this year is up from last year, but still well below the figures for 1983 and 1984. And the no-increase group always includes a number of new-hires.

The most impressive salary increase performance again came from the ceramists with 55.4% getting increases of 6% or more last year. In our previous report they led with 60% in this category. Mathematicians follow the ceramists with 53.9% getting raises of 6% or more last year; 53.5% of the metallurgists got such raises, as did 50.2% of the chemists. Geologists were displaced from the low end by aeronautical engineers with only 37.5% of the latter getting increases of 6% or better last year.

One result of these increases is to make workers in research, development, and quality assurance an affluent demographic segment. For this group, the paychecks in 1986 will total $24.5 billion. This can be compared to $18.9 billion just two years ago.

Rankings for disciplines by median salaries

Rank			Median salary		
1986	1985	Discipline	1986	1985	% increase
1	3	Metallurgist	$49,166	$44,580	10.3
2	2	Aero. Engr.	48,181	49,330	−2.3
3	5	Physicist	47,426	43,120	9.9
4	7	Chem. Engr.	44,619	42,390	5.3
5	4	Ceramist	44,285	43,450	1.9
6	1	Mathematician	44,166	51,200	−13.7
7	8	Elec. Engr.	43,291	42,910	0.9
8	6	Mech. Engr.	41,901	42,180	−0.7
9	9	Geologist	41,136	41,830	−1.7
10	10	Chemist	40,295	39,040	3.2
11	13	Biologist	37,013	34,960	5.9
12	11	Indust. Engr.	36,696	38,280	−4.2
13	12	Other	35,194	35,190	2.8

The median salary for all respondents in this study is $41,449, up 3.2% from last year's $40,180.

Looking at median salaries by disciplines, we see that mathematicians fell substantially from their leadership position of last year to be replaced this year by metallurgists. This is explained, in part, by the fact that the largest gain in median salary was made by metallurgists with 10.3%. Physicists were next at 9.9, followed by biologists at 5.9%.

This brings up the question of how there can be the salary increases that we mentioned above and at the same time have declines in median salaries. This, we must concede, could be a result of sampling error. However, this study has appeared to escape such sampling glitches in the past, and the number of respondents remains good for conclusions based on the total population.

At the same time, as mentioned earlier, there are indications in other portions of the study that early retirement programs, which have been fairly common in U.S. industry this past year, may be having an impact on our results. This shows up in our reports on years of experience, years with present employer, and median age of respondents.

There continues to be a premium on age, experience and advanced degrees in research and development, but the scale has been shifted. Where previously the median age of our respondents had moved steadily upward beginning in 1980 with 40.4 years followed by 40.9, 40.9, 41.4, 41.5, and 42.0, this year's median age is once again 40.9 years.

Likewise, the median years of experience of our respondents has increased in recent studies from 15.8 in 1982 to 16.5 in 1985. This year it is 15.5 years.

When salary is correlated to experience, the premium that is paid for experience remains obvious, despite the downward shift in the scale. For this year's respondents with less than one year's experience, the median income is $24,375, compared to $27,020 last year. Median income for those with one through five years of experience is $31,957, up from $30,380. For six through 10 it is $35,596 compared to last year's $35,030.

At the upper end of the experience range, those with 36 through 40 years' experience have a median income of $48,321 this year, compared to $46,967 last year.

The percentage of respondents with PhD degress has moved from 27.6 in 1980 with only one hesitation to 33.1% in 1985. This latest study places the figure at 30.1%, once again suggesting that the top end of the R&D work force has been lopped off by early retirement programs.

Biologists lead the field with the most respondents having PhDs at 54.1%. When masters and doctorates are considered together and disciplines are ranked for advanced degrees, biologists continue to lead with 78.1%, followed by physicists at 76.0, ceramists 66.7, and geologists 66.0.

In the second part of this report we will look into the implications of some of the above conclusions and also report on the value os advanced degrees in this recently-modified world of research and development. We also will examine relative pay scales for men and women, and the advantages in salaries for jobs in industry, government, and universities. R&D